DATA REQUIREMENTS DESCRIPTION (DRD)

1. **DPD NO.**: XXX **ISSUE**: Standard
2. **DRD NO.**: **STD/CM-EDAL**
3. **DATA TYPE**: 3
4. **DATE REVISED**:
5. **PAGE**: 1/3
6. **TITLE**: Engineering Drawings and Associated Lists

7. **DESCRIPTION/USE**: To provide engineering data defining the design to the extent required to support manufacturing, test, and logistics support of the vehicle and payload systems and required spare parts. Engineering drawings and associated lists shall be sufficient to depict the detailed configuration of all system, subsystem, and component levels and to include ground support equipment (GSE) and airborne support equipment (ASE). 2D and 3D CAD models shall be submitted as supplemental information.

8. **OPR**: ED03 9. **DM**:

10. **DISTRIBUTION**: Per Contracting Officer's letter

11. **INITIAL SUBMISSION**: Three weeks prior to Preliminary Design Review (PDR)

12. **SUBMISSION FREQUENCY**: Three weeks prior to each major review, as part of an Acceptance Data Package (ADP), and as requested. In addition, 3D CAD Models shall be submitted between milestones as requested by the procuring activity.

13. **REMARKS**:
14. **INTERRELATIONSHIP**:

15. **DATA PREPARATION INFORMATION**:

15.1 **SCOPE**: Engineering drawings disclose (directly or by reference) the physical and functional requirements of an item by means of graphics or textual presentation or combinations of both, as supplemented by 3D models.

15.2 **APPLICABLE DOCUMENTS**

ASME Y14.100	*Engineering Drawing Practices*
ASME Y14.41	*Digital Product Definition Data Practices*
ASME Y14.5M	*Dimensioning and Tolerancing*
MIL-STD-961	*Department of Defense Standard Practices, Defense Specifications*

15.3 **CONTENTS**: Requirements:

a. Part I - Engineering drawings and associated lists shall meet the requirements of ASME Y14.100. Geometric Dimensioning and Tolerancing shall be implemented in accordance with ASME Y14.5M. Supplemental 2D/3D CAD shall meet the requirements of ASME Y14.41. Engineering drawings and associated lists of end items, elements and/or all components and assemblies shall be provided to define the details necessary for the manufacture, test, inspection, operations and logistic support of the system. This definition shall:
   1. Reflect the end-product at its current level of design maturity.
   2. Provide the engineering data for logistics support products.
   3. Provide the necessary data to permit manufacture and/or acquisition of items identical to the original item(s).
   4. Document directly or by reference the following:
      (a) Details of unique processes (i.e., not published or generally available to industry) when essential to design and manufacture.

DRD Continuation Sheet

15. **DATA PREPARATION INFORMATION (CONTINUED)**:

(b) Performance ratings.
(c) Dimensional and tolerance data (Geometric Dimensioning and Tolerancing (GDT) shall be required between all external and major internal interfaces).
(d) Critical manufacturing processes and assembly sequences, and rigging procedures.
(e) Diagrams.
(f) Mechanical and electrical connections.
(g) Physical characteristics, including form and finish.
(h) Details of material identification, including heat treatment and protective coatings.
(i) Inspection, test, and evaluation criteria.
(j) Equipment calibration requirements.
(k) Quality assurance requirements.
(l) Hardware marking requirements.
(m) Requirements for reliability, maintainability, environmental conditions, shock, and vibration testing and other operational or functional tests.

5. Limited rights-in-data items - Engineering drawings for items which the Government does not have unlimited rights in data shall specify the form, fit, and function requirements of the item and conform to the requirements for a control drawing as defined in ASME Y14.100 or a specification prepared in accordance with the requirements of MIL-STD-961.

b. Part II - Cable interconnect diagrams (CID's), electrical system schematics, and wiring lists. Cable interconnect diagrams, electrical system schematics, wiring lists, and fluid system schematics shall be prepared in accordance with ASME Y14.100. Part I drawings shall be utilized to the maximum extent possible in providing the design definition. The drawings shall include the following:

1. Cable interconnect diagrams shall show graphically the arrangement of external electrical cabling which interconnects electrical assemblies and/or equipment. The CID shall show all cable runs and terminations; each cable shall be identified by reference designation number. The connector short sign shall be identified.
2. Electrical system schematics shall illustrate and describe circuit items with symbols placed such that a circuit may be traced from item to item in the sequence of its function. The placement and arrangement of these circuits shall follow a logical sequence of presentation to provide a clear description of the distribution.
3. Component Level Documentation - Schematics and/or wiring lists for components, including interconnecting cable harnesses, shall be provided.
4. Overall Grounding Documentation - The grounding schematic shall show the details of all grounds and power returns from source to loads. All connections shall be shown. It shall also show details of all Electrical Ground Support Equipment interconnections to facility and safety grounds.
5. The Fluid system schematic shall illustrate and describe all components with symbols and flow designators such that the fluid system may be traced from component to component (such as pumps, valves, meters, regulators, and filters). The schematics shall document the range requirements (flow, temperature, and pressure) for all component external interfaces and line sizes. The placement and arrangement of these components shall follow a logical sequence of presentation to provide a clear description of the flow of fluids in the system. The schematics shall reference engineering drawings and associated lists for configuration details.

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15. **DATA PREPARATION INFORMATION (CONTINUED)**:

15.4 **FORMAT**: Format of engineering drawings shall be in accordance with ASME Y14.100. Drawings shall be delivered in PDF format. 2D/3D CAD shall be in accordance with ASME Y14.41, in the current version of native developed CAD, fully parametric and associative. The contractor shall deliver ProEngineer compatible 3D models of the components. Alternate formats may be acceptable upon negotiation. All documentation/data shall include the contractor's CAGE code and document numbers. The Contractor may submit electronic files of drawings and CAD models via CD, DVD, or direct electronic transfer (Product Data Management (PDM) Tool, FTP, etc.) as specified by the Government [Requisitioner: specify preferred electronic delivery method if known].

For all binary deliveries the contractor shall include a listing of the creating environment to include:

a. CAD product name/version/patches
b. Subordinate (plug-in) software/version/patches
c. Description of hardware
d. Operating system/version/patches

15.5 **MAINTENANCE**: All documents produced under this DRD must be maintained current. Changes to and/or updating of engineering drawings and associated lists shall be in accordance with the contractor's approved drawing system and the provisions herein. Changes to engineering drawings under the Government's Class I change control shall be submitted by Engineering Change Proposal. The contractor shall maintain the capability to restore and modify any engineering data used in the design through the project lifecycle.

NOTE to Engineering Drawings and Associated Lists
STD/CM-EDAL

NOTE TO REQUISITIONER:

There are issues with tailoring this DRD to allow the contractor to utilize 3D CAD models only with no 2D engineering drawings that should be considered before making the decision. The issues are:

a) NPR 1441.1, NASA Record Retention Schedules, Schedule 8, Item 5.1.A for Program/Project records requires 2D drawings to be retained as a Permanent record, and does not allow for 3D CAD format.
b) The procuring organization must plan resources to store, host, and maintain the 3D CAD files when they are delivered to the Center.
    a. Store records during active phase and for long term retrieval capability. 3D CAD data is not retrievable past 3-5 year software version life unless software, hardware, and files are updated and maintained.
    b. Host CAD to provide capability to view CAD files for evaluation during design reviews, etc.
    c. Receive CAD files that will meet the needs of the technical community for integration, analyses, etc.
    d. If control of the 3D models will be transferred from the contractor to the Government, ensure that the Center has the ability to control and release CAD models.
c) The necessary information for manufacturing, inspection, and test must be included in the 3D model. It is recommended that design, quality, and configuration management review the contractor's internal procedures to ensure adequate documentation and control of the as-designed and as-built configurations.

Sample Statement of Work words*:

> Engineering Drawings and Associated Lists. Engineering drawings and associated lists shall be provided to meet the requirements of ASME Y14.100 and ASME Y14.41 in accordance with DRD STD/CM-EDAL. This documentation shall define the detail design of the hardware and firmware for the system.

Sample complete CM SOW section available from CDRM.

Note:
These instructions on DRD applicability are not part of the DRD and should not be included in a DPD.